

CHAPTER 9

FIRE PROTECTION SYSTEMS (This Chapter is Entirely Unique to Massachusetts)

780 CMR 901.0 GENERAL

901.1 Scope: The provisions of 780 CMR 9 shall specify where *fire protection systems* are required and shall apply to the design, installation, maintenance and operation of all *fire protection systems* in all buildings and structures.

901.1.1 Seismic Requirements: All “required” and “non-required” fire protection systems shall be installed in accordance with the Seismic Criteria requirements of 780 CMR 1612.7, Architectural, Mechanical and Electrical Components and Systems.

901.2 Required systems: All *fire protection systems* required by 780 CMR shall be installed, repaired, operated and maintained in accordance with this code and the applicable reference standards listed in *Appendix A*. All required *fire suppression* and *standpipe systems* shall be provided with at least one automatic supply of fire-extinguishing agent of adequate pressure, capacity and reliability to perform the function intended.

901.3 Nonrequired systems: Any *fire protection system* or portion thereof not required by 780 CMR shall be permitted to be finished for partial or complete protection provided that such installed system meets applicable requirements of 780 CMR. A building permit shall be required for systems installed pursuant to 780 CMR 901.3

901.4 Maintenance: All water based fire protection systems shall be maintained in accordance with NFPA 25 as listed in *Appendix A*. All other *fire protection systems* shall be maintained in accordance with the requirements of the applicable reference standards and standards listed in *Appendix A*. The owner, tenant or lessee of every building or structure shall be responsible for the care and maintenance of all fire protection systems, including equipment and devices, to ensure the safety and welfare of the occupants. Fire protection systems shall not be

disconnected or otherwise rendered unserviceable without first notifying the local fire department in accordance with M.G.L. c. 148 § 27A.

When installations of fire protection systems are interrupted for repairs or other necessary reasons, the owner, tenant or lessee shall immediately advise the local fire department and shall diligently prosecute the restoration of the protection.

901.5 Threads: All threads provided for fire department connections to *sprinkler systems*, *standpipes*, yard hydrants or any other fire hose connection shall be compatible with the connections used by the local fire department.

901.6 Signs: All signs required to identify fire protection equipment, equipment rooms and equipment locations shall be constructed of durable materials, be permanently installed and be readily visible. Letters and numbers shall contrast with the sign background, shall be at least two inches in height and shall have an appropriate width-to-height ratio to permit the sign to be read easily from a distance of ten feet. The sign and location shall be approved by the local fire department.

Exception: See also 780 CMR 906.8 for entrance doors to sprinkler control valve rooms and 780 CMR 915.8 for fire department connections.

780 CMR 902.0 DEFINITIONS

902.1 General: The following words and terms shall, for the purposes of 780 CMR 9 and as used elsewhere in 780 CMR, have the meanings shown herein.

Alarm verification: A feature of automatic fire detection systems to reduce unwanted alarms wherein *automatic fire detectors* report alarm conditions for a minimum period of time, or confirm alarm conditions within a given period, after being automatically reset to be accepted as a valid alarm initiation signal (see 780 CMR 918.0).

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Approval/Permit To Install: The term refers to permits outside the jurisdiction of the building official, issued under authority of M.G.L. c. 148, § 10A or 527 CMR.

Authority Having Jurisdiction: The term "Authority Having Jurisdiction" as used in the NFPA Standards as referenced in 780 CMR 9, shall mean the building official for enforcement of 780 CMR and the BBRS for interpretation, waiver or variances (see 780 CMR 122.0; see official interpretation number 35-94 listed in Appendix B)

Automatic: As applied to fire protection devices, automatic refers to a device or system that provides an emergency function without the necessity of human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise or increase in the level of combustion products - such as incorporated in an *automatic sprinkler system, automatic fire door, etc.*

Automatic fire suppression system: An engineered system using carbon dioxide (CO₂), foam, wet or dry chemical, a halogenated extinguishing agent, or an *automatic sprinkler system* to detect automatically and suppress a fire through fixed piping and nozzles (see 780 CMR 904.0).

Construction Documents: As defined in 780 CMR 2.

Deluge system: An *automatic sprinkler system* consisting of open *sprinklers* with *water supply* valves activated by a separate automatic detection system (see 780 CMR 908.0).

Detector, heat: An alarm-initiating device that detects abnormally high temperature or rate of temperature rise (see 780 CMR 918.0).

Detector, smoke: An alarm-initiating device that detects the visible or invisible particles of combustion (see 780 CMR 918.0).

Emergency Voice/alarm signaling system: A system that provides, to the occupants of a building, dedicated manual or automatic facilities, or both, for originating and distributing voice instructions, as well as alert and evacuation signals that pertain to a fire emergency (see 780 CMR 917.0).

Fire alarm box, manual: A manually operated alarm-initiating device that activates a fire protective signaling system (see 780 CMR 917.0).

Fire command station (Fire command center): The principal location where the status of the detection, alarm, communications and control systems is displayed, and from which the system(s) has the capability for manual control (see 780 CMR 403.7 and 917.9).

Fire Department Designee: An individual authorized by the chief of the fire department to

review and approve fire protection system plans and installation.

Fire detector, automatic: An alarm-initiating device that automatically detects heat, smoke or other products of combustion (see 780 CMR 918.0).

Fire Protection Construction Documents: Documents containing the requirements of 780 CMR 903.1.1, 903.1.2, 903.1.3.

Fire protection system: Devices, equipment and systems used to detect a fire, activate an alarm, suppress or control a fire, or any combination thereof.

Fire Protective Signaling System (Fire Alarm System): A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal initiating devices and to initiate appropriate response to those signals.

Household Fire Warning System: A household fire warning system consists of single or multiple station detectors or a listed control unit with automatic fire detectors and occupant notification appliances. The household fire warning system serves only one dwelling unit, patient room, hotel room or other single area depending on use group requirements in 780 CMR 919.1 through 919.3

Installing Contractor: An individual or firm duly licensed to install fire protection systems. (See 780 CMR 903.3)

• *Automatic Sprinklers Systems - M.G.L. c. 146, §§ 81 through 85A, 528 CMR 11.00 and 12.00*

• *Fire Extinguishing systems - M.G.L. c. 148, §§ 58, 527 CMR 23.00*

• *Fire Alarm Systems - M.G.L. c. 141, §§ I through 10, 237 CMR 1.00 through 6.00*

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Maintenance of Fire Protections Systems:

Replacement or repair of any component or components of a fire protection system, where such does not affect system performance and compatibility. (Also see *Modifications, Alterations, Additions or Deletions to Fire Protection Systems*). No building permit is required for maintenance. Other permits, however, may be required pursuant to M.G.L. c.148, § 27A and 527 CMR.

Modifications, Alterations, Additions or Deletions to Fire Protection Systems: Any changes which affect the performance of the fire protection system. (Also see *maintenance*). Such changes require a building permit and are subject to other permitting requirements pursuant to M.G.L. c. 148, § 27A.

Master Box: A municipal fire alarm box that may also be operated by remote means.

Municipal Fire Alarm System: A system of alarm initiating devices, receiving equipment, and connecting circuits (other than a public telephone network) used to transmit alarms from street locations to the public fire service communications center.

Preaction system: A fire *sprinkler* system employing automatic *sprinklers* attached to a piping system containing air with a supplemental fire detection system installed in the same areas as the *sprinklers*. Actuation of the fire detection system automatically opens a valve that permits water to

flow into the *sprinkler* piping system and to be discharged from any open *sprinklers* (see 780 CMR 906.9.6).

Proprietary supervising station: Refer to the definition in chapter 1 of NFPA-72 and to further details as identified in chapter 4 of NFPA-72 as listed in Appendix A.

Registered Professional Engineer: A Registered Professional Engineer registered by the Board of Registration of Professional Engineers and of Land Surveyors in accordance with M.G.L. c. 112, §§ 81D through 81T and 250 CMR (see 780 CMR 903.1.3 and 903.5).

Remote station fire alarm system supervising station: Refer to the definitions in chapter 1 of NFPA-72 and to further details as identified in chapter 4 of NFPA-72 as listed in Appendix A.

Shop Drawings: Scaled detailed working drawings (system layout) and equipment specifications (cut sheets) indicating all information in accordance

with requirements of the applicable NFPA Standards for the specific fire protection systems to be installed in accordance with the Registered Professional Engineer's plans and specifications.

Smoke detector, multiple station: Single-station smoke detectors that are capable of being interconnected such that actuation of one causes all integral or separate audible alarms to operate (see 780 CMR 919.0).

Smoke detector, single station: An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, which is operated from a power supply either in the unit or obtained at the point of installation (see 780 CMR 919.0).

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NON-TEXT PAGE

Smoke detector, system type: A smoke detector designed to be connected to a fire alarm control panel.

Sprinkler: A device, connected to a *water supply* system, that discharges water in a specific pattern for extinguishment or control of fire (see 780 CMR 906.0).

Sprinkler system, automatic: A *sprinkler* system, for fire protection purposes, is an integrated system of underground or overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable *water supply*. The portion of the system above the ground is a network of specially or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which automatic *sprinklers* are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the *fire area* (see 780 CMR 906.0).

Sprinkler system, limited area: An *automatic sprinkler system* consisting of not more than 20 *sprinklers* within a *fire area* (see 780 CMR 907.0).

Standpipe system: A *standpipe* system is a *fire protection system* consisting of an arrangement of piping, valves, hose outlets and allied equipment installed in a building or structure (see 780 CMR 914.0).

Supervisory device: An initiating device used to monitor the conditions that are essential for the proper operation of *automatic fire-protection systems* (i.e., switches used to monitor the position of gate valves, a low air-pressure switch on a dry-pipe *sprinkler system*, etc.) (see 780 CMR 923.0).

U.L. Listed or FM approved central station service: *Central station service as defined in Chapter 1*

of NFPA-72 and as further identified in chapter 4 of NFPA 72 as listed in Appendix A.

Water supply, automatic: A water supply that is not dependent on any manual operation, such as making connections, operating valves or starting pumps (see 780 CMR 914.5).

780 CMR 903.0 FIRE PROTECTION SYSTEMS APPROVAL/ACCEPTANCE

903.1 Required: Complete *fire protection construction documents* shall be submitted in accordance with 780 CMR 110 and a building permit obtained prior to the installation of all "required" or "non required" fire protection systems, including *modifications, alterations, additions or deletions* to an existing fire protection system. The *fire protection construction documents* shall contain sufficient information to completely describe the *fire protection systems*, including operational features. The information required pursuant to 780 CMR 903.0 shall include, where required, the items listed in 780 CMR 903.1.1:

Exception 1: *Maintenance*; no building permit required.

Exception 2: For modifications, alterations, additions or deletions which do not affect system performance or compatibility; no building permit is required unless otherwise directed by the Building Official (Note also refer to M.G.L. c.148, § 27A).

903.1.1 Fire Protection Construction Documents:

1. a. Basis (methodology) of design for the protection of the occupancy and hazards for compliance with 780 CMR and applicable NFPA Standards, in the form of a narrative report.
- b. Sequence of operation of all fire protection systems and operation in the form of a narrative report.

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- c. Testing criteria to be used for final system acceptance in the form of a narrative report.
2. Building and site access for fire fighting and/or rescue vehicle(s) and personnel.
3. Fire hydrant(s) location and water supply information.
4. Type/description and design layout of the automatic sprinkler system(s).
5. Automatic sprinkler system(s) control equipment location.
6. Type/description and design layout of the automatic standpipe system(s).
7. Standpipe system hose valve(s) type and location.
8. Fire department siamese connection type(s) and location.
9. Type/description and design layout of the fire protective signaling system(s).
10. Fire protective signaling system(s) control equipment and remote annunciator location.
11. Type/description and design layout of the smoke control or exhaust system(s).
12. Smoke control or exhaust system(s) control equipment location.
13. Building life safety system features (auxiliary functions) required to be integrated as part of the fire protective signaling system(s).
14. Type/description and design layout of the fire extinguishing system(s).
15. Fire extinguishing system(s) control equipment location.

- 16. Fire protection system(s) equipment room location.
- 17. Fire protection system(s) equipment identification and operation signs.
- 18. Fire protection system(s) alarm/supervisory signal transmission method and location.

903.1.2 Plans: All fire protection system plans shall contain sufficient information to identify the occupancy, hazards, system and equipment arrangements, system and equipment sizing, systems specifications, systems sequence(s) of operation and design/engineering calculations.

903.1.3 Design: All fire protection systems and fire protection system operation including building and site features as identified in 780 CMR 903.1.1 shall be designed and specified by a qualified *Registered Professional Engineer(s)* except as provided in M.G.L. c. 143, § 54A and any profession or trade as provided in M.G.L. c. 112, § 60L and M.G.L. c. 112, § 81R. All plans shall bear the original seal and signature of the *Registered Professional Engineer(s)*, except as provided in M.G.L. c. 143, § 54A and any profession or trade as provided in M.G.L. c. 112, § 60L and M.G.L. c. 112, § 81R. Specifications shall include requirements for the preparation of shop drawings when required by 780 CMR or applicable NFPA Standards. The *Registered Professional Engineer(s) or other legally recognized professional (M.G.L. c. 112, § 81R)* shall be responsible for the review and certify that all shop drawings conform to the approved fire protection *construction documents* as submitted for the building permit and approved by the building official.

903.1.4 As-built plans: In accordance with the applicable referenced standards, as-built plans shall be prepared by the contractor responsible for the installation of the fire protection system for the following occupancies:

- (a) High-rise buildings

- (b) Buildings and structures of Use Group A with a total occupant load exceeding 1000.
- (c) Buildings and structures of Use Group H.
- (d) Use Group I-2 and I-3 except I-2 Uses provided for in 780 CMR 424.
- (e) Bulk Merchandising/Retail occupancies (See 780 CMR 416.0).

As-built plans shall be provided to the owner upon completion.

903.1.5 Safeguarding Construction: The *fire protection construction documents* shall provide specifications for conformance to 780 CMR 33 and NFPA-241 listed in **Appendix A** in order to safeguard against fires during construction, alterations and demolition of all buildings and structures regulated by 780 CMR.

903.2 Authority: In accordance with the requirements of 780 CMR 110 and 780 CMR 903.1 the building official shall transmit one set of the *fire protection construction documents* (780 CMR 903.1.1) and *building construction documents* to the head of the fire department or his designee for review and approval of the items specified in 780 CMR 903.1.1.

Note:

1. M.G.L. c. 148 §§ 26G, 26H and 26I, when adopted by a city or town, will impact the fire protection requirements of 780 CMR 9. A building official shall consult *Official Interpretation* Number 45-96, listed in Appendix B, for guidance, where communities have adopted M.G.L. c. 148, §§ 26G, 26H, and/or 26I.
2. In addition to the building permit requirements for fire protection systems in 780 CMR, M.G.L. c. 148 § 10A and 527 CMR may impose additional installation permitting requirements.

903.2.1 Alternative Fire Protection Design Methodologies - Independent Engineering Review: Where alternative design methodologies are utilized and where such methodologies result in designs which vary from any prescriptive

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requirement of 780 CMR, the owner shall engage an independent registered professional engineer to review said alternative design methodologies. The scope of the independent registered professional engineer review shall include, but not be limited to the following;

- (a) Review of the design assumptions, methodologies and resulting proposed system designs, to determine whether the proposed fire protection system designs and any other systems which are affected by the design assumptions, are consistent with the general objectives and prescriptive provisions of this code and to determine whether or not the methodologies and assumptions conform to accepted engineering practice;
- (b) Preparation of a written report to the building official as to the appropriateness of the proposed design, specifically listing any variances from the prescriptive provisions of 780 CMR and describing, in detail, the design provisions used to achieve compliance.

If the reviewing engineer concurs with the proposed design, the owner shall make application for a variance, to the State Building Code Appeals Board as provided in 780 CMR 122. In addition to all supporting information and materials, the reviewing engineer's report required in 780 CMR 903.2.1(b) shall be included in the application for variance.

A building permit shall not be issued until the variance, if required, has been granted, or unless the building permit is issued in part, as provided for in 780 CMR 111.13.

903.3 Fire Protection Systems Installation: Fire protection systems shall be installed by contractors and personnel appropriately licensed in the Commonwealth of Massachusetts (*licensed installing contractor*). Shop drawings required for submittals and reviews by the *Registered Professional Engineer*, or other legally recognized professional (M.G.L. c. 112, § 81R), by 780 CMR 903.1.3 or by applicable NFPA Standards shall note the name(s), license number(s) and license expiration date(s) of the contractor(s) installing the fire protection systems.

903.4 Acceptance: In accordance with the provisions of 780 CMR 120, a Certificate of Occupancy shall not issue until the building official and the head of the fire department or their designees have witnessed a satisfactory functional test of all *fire protection systems*, installed in accordance with the approved *fire protection construction documents*. All fire protection systems shall be tested in accordance with the applicable provisions of 780 CMR and NFPA Standards and approved testing criteria and operational sequence as submitted in 780 CMR 903.1.1, items 1.b and c. In addition, the following documents and/or information shall be simultaneously submitted to the building official and head of the fire department or their designees prior to the witnessing of the operational fire protection system(s) testing:

1. Certification, from the *Registered Professional Engineer* or other legally recognized professional (M.G.L. c. 112, § 81R) responsible for the design in accordance with 780 CMR 903.1.3 stating that the fire protection systems have been installed in accordance with the approved *fire protection construction documents* and that he has reviewed the shop drawings for conformance to 780 CMR 903.3 and has identified deviations if any, from the approved *fire protection construction documents*.
2. Confirmation by the building owner/developer or authorized representative that they have received the as-built fire protection system shop drawings from the *installing contractor* and that

the Registered Professional Engineer or other legally recognized professional (M.G.L. c. 112, § 81R) has certified their reasonable accuracy.

3. Material, Test, Performance and Completion Certificates, properly executed by the *installing contractor* in accordance with the applicable NFPA Standards.

Exception: In lieu of witnessing a satisfactory functional test, the building official and head of the fire department or their designees may accept a final performance acceptance test report from a *Registered Professional Engineer or other legally recognized professional (M.G.L. c. 112, § 81R)*. Said report shall certify that a complete satisfactory functional test of all fire protection systems in accordance with the approved testing criteria and operational sequence have been witnessed.

903.4.1 Conditional Acceptance: The requirements of 780 CMR 903.4 shall not preclude the issuance of a temporary Certificate of occupancy by the Building Official in accordance with 780 CMR 120.3.

780 CMR 904.0 FIRE SUPPRESSION SYSTEMS

904.1 Where required: *Automatic fire suppression systems* shall be installed where required by 780 CMR, and in the locations indicated in 780 CMR 904.2 through 904.9.

Exceptions:

1. An *automatic fire suppression system* shall not be required in portions of buildings that comply with 780 CMR 406.0 for open parking structures less than 70 feet in height above mean grade.
2. In telecommunications equipment buildings, an *automatic fire suppression system* shall not be required in those spaces or areas occupied exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines,

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provided that those spaces or areas are equipped throughout with an *automatic fire detection system* in accordance with 780 CMR 918.0 and are separated from the remainder of the building with fire separation assemblies consisting of one-hour fireresistance rated walls and two-hour fireresistance rated floor/ceiling assemblies.

Note: Also Refer to M.G.L. c. 148, § 26A and 26G

904.1.1 Additional requirements: When a building or structure is provided with a fire alarm system, all extinguishing systems installed in accordance with the provisions of 780 CMR 904 through 914, shall be connected to the fire alarm system in accordance with the requirements of NFPA 72 as listed in *Appendix A*.

1. Existing buildings: *Existing buildings* which qualify as such in accordance with 780 CMR 3400.3.1 and which undergo a partial change in *use* to a *use* or *uses* specified in 780 CMR 904.2 or are mixed *use* buildings which undergo renovation of a *use* or *uses* specified in 780 CMR 904.2, shall be provided with automatic fire suppression systems in accordance with the following:

- (a) only in those portions of the building which have been changed in *use* and only when such space or spaces exceed 12,000 sf in *aggregate floor area*.
- (b) only in those portions of the building which have been altered or renovated provided that such renovation constitutes *substantial alterations or substantial renovations*, in accordance with 780 CMR 3401 and only when such space or spaces exceed 12,000 sf in *aggregate floor area*.

2. Public Garages: Public Garages shall conform to 780 CMR 408.0.

Note: See also M.G.L. c. 148, §§ 26A and 26G.

904.3 Use Group A-2 in buildings of 5,000 sf or greater in aggregate floor area: An *automatic fire suppression system* shall be provided throughout all

904.1.1.1 Fire pump requirements: Refer to 780 CMR 924.

904.2 Use Groups A-1, A-3, A-4, B, E, M, S-1, F-1 in buildings of 12,000 sf or greater in aggregate floor area: An automatic fire suppression system shall be provided throughout all portions or uses of all buildings of 12,000 sf or greater in aggregate area when any of the following *uses* are located within the building;

A-1, A-3, A-4, B, E, M, S-1, F-1

780 CMR 904.2 shall apply whether or not the *use* is separated from any other *use* within the building by *fire separation assemblies*.

Exceptions:

portions or *uses* of all buildings of 5,000 sf or greater in aggregate area when any A-2 *use* is located within the building;

780 CMR 904.3 shall apply whether or not the A-2 *use* is separated from any other *use* within the building by *fire separation assemblies*.

Exception:

1. Existing buildings: *Existing buildings* which qualify as such in accordance with 780 CMR 3400.3.1 which undergo a partial change in *use* to an A-2 *use* or partial renovation of an existing A-2 *use* shall be provided with an automatic fire suppression system only in those portions of the building which have been changed to an A-2 *use* or those existing A-2 *uses* which have been renovated when such renovation constitutes *substantial alterations or substantial renovations*, in accordance with 780 CMR 3401 and only when the proposed or existing A-2 *use* exceeds 5,000 sf in *aggregate floor area*.

904.4 Use Group H: An *automatic fire suppression system* shall be provided throughout all buildings of Use Group H.

Exception: Magazines used for the storage of Use Group H-1 materials which are constructed and

located in accordance with NFPA 495 and 527 CMR listed in **Appendix A**.

Note: See also M.G.L. c. 148, §§ 26A and 26G.

904.5 Use Group I: An *automatic fire suppression system* shall be provided throughout all buildings of Use Group I.

Note: See also M.G.L. c. 148, §§ 26A and 26G.

904.6 Use Group R-1: An *automatic fire suppression system* shall be provided throughout all buildings or spaces of Use Group R-1 in accordance with 780 CMR 906.2.1 or 906.2.2.

904.7 Use Group R-2: An *automatic fire suppression system* shall be provided throughout all buildings with an occupancy in Use Group R-2 in accordance with 780 CMR 906.2.1 or 906.2.2.

Exception: Buildings having no more than three dwelling units shall be permitted to have an automatic fire suppression system installed in accordance with NFPA-13D, “SPRINKLER SYSTEMS”, listed in **Appendix A**, subject to the following conditions:

a. Every automatic sprinkler system shall have at least one automatic water supply or a stored water supply source in accordance with NFPA-13D where the minimum quantity of stored water shall equal the water demand rate times 20 minutes.

b. 780 CMR 919.3.2, Exception 2, and 780 CMR 919.5, Exception, shall not apply when the automatic fire suppression system installed is installed in accordance with NFPA-13D.

This Exception shall apply to new construction or substantial renovation, or substantial alteration as defined in 780 CMR, Chapter 34

Note: See also M.G.L. c. 148, §§ 26A and 26I.

904.8 Windowless story: An *automatic fire suppression system* shall be provided throughout every story or *basement* of all buildings where there is not provided at least one of the following types of openings:

1. An exterior *stairway* that conforms to the requirements of 780 CMR 1014.0, or an outside ramp that conforms to the requirements of

780 CMR 1016.0, leading directly to grade in each 50 linear feet (15240 mm) or fraction thereof of exterior wall in the story or *basement*, on at least one side of the building.

2. Openings entirely above the adjoining ground level totaling 20 square feet (1.9 m²) in each 50 linear feet (15240 mm) or fraction thereof of exterior wall in the story or *basement*, on at least one side of the building. Openings shall have a least dimension of not less than 22 inches (559 mm), and shall have a minimum net clear opening of five square feet (0.5m²). Access to such openings from the exterior shall be provided to the fire department and such openings shall be unobstructed to allow fire-fighting and rescue operations from the exterior.

When openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22860 mm) from such openings, the story shall be equipped throughout with an *automatic sprinkler system*, or openings as specified herein shall be provided on at least two sides of the exterior walls of the story. If any portion of a basement is located more than 75 feet (22860 mm) from the openings required in 780 CMR 904.0, the *basement* shall be provided with an *automatic sprinkler system*.

Exception: Occupancies in Use Group R-3.

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904.9 Other required suppression systems: In addition to the requirements of 780 CMR 904.2 through 904.8, *automatic fire suppression systems* for certain buildings and areas shall be provided in accordance with Table 904.9.

**Table 904.9
ADDITIONAL REQUIRED SUPPRESSION
SYSTEMS⁽¹⁾**

780 CMR Section	Subject
302.1.1	Specific occupancy areas
402.10; 402.15.2	Covered mall buildings
403.2	High-rise buildings
404.2	Atriums
408.3.1	Public garages
408.4	Fuel-dispensing areas
426.0	Bulk Merchandizing/Warehouse Occupancies
780 CMR Section	Subject
411.7	Sound stages
412.6	Stages and enclosed platforms
413.4	Special amusement buildings
416.4	HPM facilities
419.3	Paint spray booths and storage rooms
	Open parking structures more than 70 feet in height above the mean grade (M.G.L. c. 148, § 26A)
507.1	Unlimited area buildings
1020.3	Exit lobbies
2806.4	Drying rooms
2807.6	Waste and linen chutes and termination and incinerator rooms
2808.4	Refuse vaults

Note (1) See also M.G.L. c. 148, §§ 26A, 26G, 26H, and 26I.

780 CMR 905.0 SUPPRESSION SYSTEM AGENT COMPATIBILITY

905.1 Agent compatibility: The extinguishing agent for each *suppression system* shall be compatible with the type of hazard and fire. Each fixed *fire suppression system* shall be of an approved type and

shall be designed and installed in accordance with the requirements of 780 CMR.

905.1.1 Special hazards: In rooms or buildings containing combustibles (such as aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quick-lime, magnesium powder or sodium peroxide) that are incompatible with water as an extinguishing agent, other extinguishing agents shall be utilized.

780 CMR 906.0 FIRE SPRINKLER SYSTEM

906.1 General: *Automatic sprinkler systems* shall be approved and shall be designed and installed in accordance with the provisions of 780 CMR.

906.2 Equipped throughout: Where the provisions of 780 CMR require that a building or portion thereof be equipped throughout with an *automatic sprinkler system*, the system shall be designed and installed in accordance with 780 CMR 906.2.1, 906.2.2 or 906.2.3.

Exception: Where water as an extinguishing agent is not compatible with the fire hazard (see 780 CMR 905.1) or is prohibited by a law, statute or ordinance, the affected area shall be equipped with an approved *automatic fire suppression system* utilizing a suppression agent that is compatible with the fire hazard.

906.2.1 NFPA 13 systems: The system shall be designed and installed in accordance with NFPA 13 listed in *Appendix A*.

906.2.2 NFPA 13R systems: In buildings four stories or less in height, systems designed and installed in accordance with NFPA 13R listed in *Appendix A* shall be permitted in Use Group I-1 buildings with not more than 16 occupants and in Use Group R buildings.

906.2.3 NFPA 13D systems: In Use Group R-3 buildings with at least two-hour fire resistance rated *fire separation assemblies* between *dwelling units*, or in Use Group I-1 buildings with not more than eight occupants, systems designed and

installed in accordance with NFPA 13D listed in *Appendix A* shall be permitted.

906.3 Design: Design documentation shall be in accordance with 780 CMR 903.

906.4 Actuation: Water *sprinkler systems* shall be automatically actuated unless otherwise specifically provided for in 780 CMR.

906.5 Sprinkler alarms: Approved audible and visual alarm devices shall be connected to every water *sprinkler system*. Such alarm devices shall be activated by water flow and shall be located in an approved location on the exterior of the building and throughout the building in accordance with the requirements of NFPA-72 listed in *Appendix A*.

906.6 Water-control valve identification: All valves controlling water to *fire protection systems* shall be provided with permanently attached identification tags indicating the valves' function and what is controlled.

906.7 Sprinkler riser: A *sprinkler system* riser which also serves as the wet standpipe riser in buildings required to have or having both systems, shall conform to 780 CMR 914.6.

906.8 Signs: Where sprinkler control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering shall be at least 2½ inches (63.5 mm) in height and shall otherwise conform to 780 CMR 901.6 and shall read "Sprinkler Control Valves."

906.9 Acceptance tests: All *sprinkler systems* shall be tested in accordance with the applicable NFPA

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Standards used for *sprinkler system* design and Installation and listed in *Appendix A*.

906.9.1 Underground connections: Underground mains and lead-in connections shall be flushed and tested in accordance with NFPA 13 and 24 listed in *Appendix A*.

906.9.2 Hydrostatic test: All *sprinkler systems* shall be tested hydrostatically in accordance with the applicable NFPA Standards listed in *Appendix A*.

780 CMR 907.0 LIMITED AREA SPRINKLER SYSTEMS

907.1 General: A *limited area sprinkler system* shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR 907.0. Complete *fire protection construction documents* shall be provided. (See 780 CMR 903.0.)

907.2 Where permitted: Where the provisions of 780 CMR require the installation of a *fire suppression system*, and a water *sprinkler* extinguishing system is used with a limited number of *sprinklers*, a *limited area sprinkler system* that complies with the requirements of 780 CMR 907.0 is permitted to be installed.

907.2.1 Special occupancy areas: A *limited area sprinkler system* shall be permitted within special occupancy areas as designated in 780 CMR 4 or within specific occupancy areas as designated in 780 CMR 302.1.1, provided that the area is enclosed within *fire separation assemblies* as required by 780 CMR, and 20 *sprinklers* or less are required to protect each separately enclosed area. Where nonfireresistance rated separation walls are permitted by Table 302.1.1 to enclose contiguous specific occupancy areas on one floor, the areas shall be considered to be one separately enclosed area for the purposes of determining the number of *sprinklers* based on the spacing limitations of NFPA 13 listed in *Appendix A*.

907.2.2 Unenclosed floor openings, waste and linen chutes, and kitchen and hazardous exhaust systems: A *limited area sprinkler system* shall be permitted to protect unenclosed *escalator* floor openings that comply with 780 CMR 907.2.2.1, chutes used for waste or linen collection, commercial kitchen exhaust systems and duct systems that exhaust *hazardous materials*.

907.2.2.1 Water curtain: The area of the floor opening shall not exceed twice the horizontal projected area of the *escalator* and the opening shall not connect more than four stories in occupancies in other than Use Groups B and M and the opening shall be protected by a draft curtain and a closed *sprinkler* water system conforming to NFPA 13 listed in *Appendix A*.

Note: Relative to *escalator* floor openings, also see 780 CMR 713.3.

907.3 Design: Except as otherwise provided for in 780 CMR 907.0, a *limited area sprinkler system* shall be designed and installed in accordance with 780 CMR 906.0.

907.4 Actuation: A *limited area sprinkler system* shall be automatically actuated.

907.5 Sprinkler alarms: Alarms and alarm attachments shall be required and shall be located and installed in accordance with the requirements of 780 CMR 906.5.

907.6 Standpipe connection: The *water supply* for the *limited area sprinkler system* shall be from the building *standpipe system* where the building is equipped with a *standpipe system* that is sized for a 500-gallon-per-minute (0.032 m³/s) minimum flow and has an *automatic water supply* (see 780 CMR 914.5).

907.6.1 Domestic supply: Where *limited area sprinkler systems* are supplied from the domestic water system, the domestic water system shall be

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designed to support adequately the design flow of the largest number of *sprinklers* required to be hydraulically calculated by NFiPA 13 listed in **Appendix A** in any one of the enclosed areas plus the domestic demand.

907.6.2 Cross connection: The potable water supply shall be protected against backflow in accordance with the requirements of the Plumbing and Gas Code (248 CMR), and the Department of Environmental Protection Regulations, 310 CMR as listed in **Appendix A** as well as any cross-connection protection criteria legally set forth by the water supplier/purveyor having local jurisdiction.

907.6.3 Domestic connection: Shutoff valves shall not be permitted in the *suppression system*

908.1 General: Water-spray fixed systems for fire suppression shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFiPA 15 listed in **Appendix A**. A water-spray fixed system is a system connected to a reliable source of water supply and equipped with normally open water-spray nozzles for specific discharge and distribution over the surface or area to be protected.

908.2 Design: Complete *fire protection construction documents* and hydraulic calculations shall be submitted for review prior to installation. The submittal shall include nozzle layouts, friction loss, calculations, *water supply* data and a detailed layout of the entire area to be protected. (See 780 CMR 903.0.)

908.3 Actuation: Water-spray systems shall be automatically actuated and shall be provided with a manual means of actuation.

908.4 Acceptance tests: All new system piping shall be flushed and tested in accordance with the provisions of NFiPA 15 listed in **Appendix A**.

780 CMR 909.0 CARBON DIOXIDE

piping. *Water supply* shall be controlled by the riser control valve to the domestic water piping.

Exception: Shutoff valves in the *sprinkler system* piping are permitted provided that such valves are supervised in accordance with 780 CMR 923.0.

907.7 Acceptance tests: All limited area *sprinkler systems* shall be tested as stipulated in 780 CMR 906.9.

780 CMR 908.0 WATER-SPRAY FIXED SYSTEMS**EXTINGUISHING SYSTEMS**

909.1 General: Carbon dioxide extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFiPA 12 listed in **Appendix A**. A carbon dioxide extinguishing system is a system which supplies CO₂ from a pressurized vessel through fixed pipes and nozzles.

909.2 Design: The details of the system indicated on the *fire protection construction documents* shall include information and calculations of the amount of carbon dioxide; the location and flow rate of each nozzle including equivalent orifice area; and the location and size of the carbon dioxide storage facility. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained. (See 780 CMR 903.0.)

909.3 Actuation: Carbon dioxide extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

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909.4 Safety requirements: Where persons will enter or be trapped in atmospheres made hazardous by carbon dioxide discharge, warning signs and discharge alarms shall be provided.

909.5 Acceptance tests: All carbon dioxide extinguishing systems shall be tested in accordance with NFPA 12 listed in *Appendix A*. A completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder high-pressure systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made.

780 CMR 910.0 DRY-CHEMICAL EXTINGUISHING SYSTEMS

910.1 General: Dry-chemical extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFPA 17 listed in *Appendix A*. A dry-chemical extinguishing system is a system consisting of dry chemical and expellant gas storage tanks, fixed piping and nozzles used to assure proper distribution of an approved extinguishing agent to a specific fire hazard or into an area of potential fire.

910.2 Design: The details of the system indicated on the *fire protection construction documents* shall include sufficient information and calculations of the amount of dry chemical; the size, length and arrangement of connected piping, or piping and hose; and a description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to

identify properly the apparatus and devices used. Any special features shall be adequately explained. (See 780 CMR 903.0.)

910.3 Actuation: Dry-chemical extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

910.4 Safety requirements: Where persons will be exposed to a dry-chemical discharge, warning signs and discharge alarms shall be provided.

910.5 Acceptance tests: All dry-chemical extinguishing systems shall be tested in accordance with NFPA 17 listed in *Appendix A*. A completed system shall be tested by a discharge of expellant gas through the piping and nozzles. Observations for gas leakage and for continuity of piping with free unobstructed flow shall be made. Observations shall be made of the flow of expellant gas through all nozzles. The labeling of devices with proper designations and instructions shall be checked. After testing, all piping and nozzles shall be blown clean using compressed air or nitrogen, and the system shall be properly charged and placed in the normal "set" condition.

910.5.1 Discharge test: All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as

well as observing for leakage and continuity of piping with free unobstructed flow.

910.6 Range hoods: In addition to the requirements of 780 CMR 910.0 and the applicable NFPA standards listed in *Appendix A*, range hood dry-chemical systems shall bear the *label* of an *approved agency*.

The system shall be installed in accordance with the manufacturer's installation instructions. The dry-chemical agent of the system shall be nontoxic.

780 CMR 911.0 FOAM-EXTINGUISHING SYSTEMS

911.1 General: Foam-extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFiPA 11, 11A and 16 listed in *Appendix A*. A foam-extinguishing system is a special system designed to discharge, either mechanically or chemically, a foam made from concentrates, over the area to be protected.

911.2 Design: The details of the system indicated on the *fire protection construction documents* shall include complete computations show-testing pressure drop in all system piping, friction loss calculations of liquid lines and a detailed layout of the entire hazard area to be protected. Hydraulic characteristics of foam proportioners and foam makers as determined by tests shall be supplied by the manufacturer to the department (including the range of operating conditions required for the proposed installation) to permit determination of the adequacy of the hydraulics of the proposed protection. (See 780 CMR 903.0.)

911.3 Actuation: A foam-extinguishing system shall be automatically actuated and shall be provided with a manual means of actuation.

911.4 Safety requirements: In any proposed use of a medium- or high-expansion foam where persons

will be exposed to the foam discharge, warning signs and discharge alarms shall be provided.

911.5 Acceptance tests: All foam-extinguishing systems shall be tested in accordance with NFiPA 11, 11A and 16 listed in *Appendix A*. The system shall be subjected to a flow test to insure that the hazard area is fully protected in compliance with the design specifications, and to determine flow pressures, actual discharge capacity, foam quality, consumption rate of foam-producing materials, manpower requirements and other operating characteristics.

780 CMR 912.0 HALOGENATED EXTINGUISHING SYSTEMS

912.1 General: Halogenated extinguishing systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFiPA 12A and 12B listed in *Appendix A*. A halogenated extinguishing system is a system consisting of pipes, open nozzles and a container of halogenated agent under pressure.

912.2 Design: The details of the system indicated on the *fire protection construction documents* shall include information and calculations of the amount of extinguishing agent; the container storage pressure; the location and flow rate of each nozzle including equivalent orifice area; the location, size and equivalent lengths of pipe, fittings and hose; and the location and size of the storage facility. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained. (See 780 CMR 903.0.)

912.3 Actuation: Halogenated extinguishing systems shall be automatically actuated and shall also be provided with a manual means of actuation.

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912.4 Safety requirements: Where persons will enter or be trapped in atmospheres made hazardous by a halogenated system discharge, warning signs and discharge alarms shall be provided.

912.5 Acceptance tests: All halogenated extinguishing systems shall be tested in accordance with NFPA 12A and 12B listed in *Appendix A*. completed system shall be tested for tightness up to the selector valve, and for continuity of piping with free unobstructed flow beyond the selector valve. The labeling of devices with proper designations and instructions shall be checked. Operational tests shall be conducted on all devices except cylinder valves in multicylinder systems. Where conditions prevail that make it difficult to determine adequately the system requirements or design, a suitable discharge test and concentration analysis shall be made.

780 CMR 913.0 WET-CHEMICAL RANGE HOOD EXTINGUISHING SYSTEMS

913.1 General: Wet-chemical extinguishing systems shall be installed in accordance with the provisions of 780 CMR 913.0, and the BOCA Mechanical Code and NFPA 17A listed in *Appendix A*. The system shall bear the *label* of an *approved agency* and shall be installed in accordance with the manufacturer's installation instructions. A wet-chemical system is a solution of water and potassium-car-bonate-based chemical, potassium-acetate-based chemical or a combination thereof which forms the extinguishing agent.

913.2 Design: The details of the system indicated on the *fire protection construction documents* shall include sufficient information and calculations on the amount of wet chemical; the size, length and arrangement of connected piping; and a description and location of nozzles so that the adequacy of the system can be determined. Information shall be submitted pertaining to the location and function of *detecting devices*, operating devices, auxiliary equipment and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used. Any special features shall be adequately explained. (See 780 CMR 903.0.)

913.3 Actuation: Wet-chemical extinguishing systems shall be automatically actuated and shall be provided with a manual means of actuation.

913.4 Safety requirements: Where persons will be exposed to a wet-chemical discharge, warning signs and discharge alarms shall be provided.

913.5 Acceptance tests: All wet-chemical extinguishing systems shall be tested in accordance with NFPA 17A listed in *Appendix A*. A completed system shall be tested by discharge of wet chemical in sufficient amounts to verify that the system is properly installed and functional. Tests shall include a check of the detection systems, the alarms and the

releasing devices, including manual stations, fuel and power shutoff devices and other associated equipment.

913.5.1 Discharge test: All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as well as observing for leakage and continuity of piping with free unobstructed flow.

780 CMR 914.0 STANDPIPE SYSTEMS

914.1 General: Standpipe systems shall be designed, installed and maintained in accordance with the provisions of 780 CMR and NFPA-14 listed in *Appendix A*. Where *standpipe systems* are required by 780 CMR, such systems shall be automatic wet systems. Automatic dry and semi-automatic dry *standpipe systems* shall be permitted only in areas subject to freezing. Complete *fire protection construction documents* shall be provided. (See 780 CMR 903.0.)

914.2 Where required: Class I *standpipe systems* shall be installed where required by 780 CMR 914.2.1 through 914.2.11 and shall be located in accordance with the provisions of NFPA 14, listed in *Appendix A*.

914.2.1 Use Group A: In all buildings or structures or portions thereof of Use Group A when:

1. Two or more stories in height of Use Group A-1, A-2, or A-3, and having an occupant load or more than 300; or;
2. Three or more stories in height regardless of the area per floor; or;
3. Having an auditorium seating over 500. Standpipes shall be located one on each side of the auditorium in each tier, one in each mezzanine, one in each tier of dressing rooms, and protecting each property, store and work room; or;

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4. Having a stage. Standpipes shall be located on each side of the stage.

Such standpipes shall be not less than 2½-inch diameter, equipped with approved 1½ inch hose station.

914.2.2 Use Group B: In all buildings or structures or portions thereof of Use Group B when:

1. Three or more stories in height, and more than 3,000 square feet in area per floor; or;
2. Four or more stories in height regardless of the area per floor.

914.2.3 Use Group E: In buildings or structures or portions thereof of Use Group E when three or more stories in height regardless of the area per floor or when having a stage or auditorium in accordance with 780 CMR 914.2.1(3) and 914.2.1(4).

914.2.4 Use Group F: In all buildings or structures or portions thereof of Use Group F when:

1. Three or more stories in height, and more than 3,000 square feet in area per floor, or;
2. Four or more stories in height regardless of the area per floor.

914.2.5 Use Group H: In all buildings or structures or portions thereof of Use Group H when:

1. Three or more stories in height, and more than 10,000 square feet in area per floor; or;
2. Four or more stories in height, regardless of the area per floor.

914.2.6 Use Group I: In all buildings or structures or portions thereof of Use Group I, three or more stories in height, regardless of the area per floor.

914.2.7 Use group M: In all buildings or structures or portions thereof of Use Group M when:

1. Three stories or more in height, and more than 3,000 square feet in area per floor, or;
2. Four or more stories in height regardless of the area per floor, or;
3. Classified as a covered mall building within the mall portions (see 780 CMR 4).
4. Classified as a bulk/merchandising warehouse. (See 780 CMR 4.)

914.2.8 Use Group R-1 and R-2: In all buildings or structures or portions thereof of Use Group R-1 and R-2 when:

1. Three or more stories in height and of Use Group R-1 regardless of the area per floor; or;
2. Three or more stories in height and more than 10,000 square feet in area per floor, or;
3. Four or more stories in height regardless of the area per floor.

914.2.9 Use Group S: In all buildings or structures or portions thereof of Use Group S, other than public garages which shall conform to 780 CMR 914.2.10 when:

1. Three or more stories in height, or Use Group S-1, and more than 3,000 square feet in area per floor; or;
2. Three or more stories in height, Use Group S-2, and more than 10,000 square feet in area per floor; or;
3. Four or more stories in height of Use Groups S-1 or S-2 regardless of the area per floor.

914.2.10 Use Group U: In all buildings or structures or portions thereof of Use Group U when:

1. Three or more stories in height and more than 10,000 square feet in area per floor; or;
2. Four or more stories in height regardless of the area per floor.

914.2.11 Public Garages: In all Group I and 11 public garages and open parking structures when:

1. More than 10,000 square feet in area per floor; or;
2. More than 7,500 square feet in area per floor and more than **one story** in height; or;
3. More than 5,000 square feet in area per floor, and more than two stories in height; or;
4. More than three stories in height; or;
5. Located in buildings where the upper stories are designed for other uses; or;
6. When located in any story that is more than 50% below grade.

Exception: Standpipe systems can be "Class I Manual Dry Type" as defined by NFPA-14 for open parking structures less than 70' in height.

914.3 Standpipe system piping sizes: The riser piping, supply piping, and the water service piping shall be hydraulically sized in accordance with the provisions of NFPA-14 listed in *Appendix A*.

Exception: The residual pressure(s) as noted in NFPA-14 are not required to be maintained in buildings less than 70 feet in height which are equipped throughout with an approved automatic fire suppression system. However the system shall be designed to accommodate the outlet pressures and water flows in accordance with NFPA 14 and inlet pressures consistent with local fire department equipment..

914.4 High-rise buildings: All buildings more than 70 feet in height above the mean grade shall have each floor supplied by a minimum of two combination standpipe/sprinkler risers installed in accordance with the requirements of NFPA-14, listed in *Appendix A*.

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914.5 Outlets: Standpipe system outlets shall comply with the provisions for, Class III Systems of NFPA-14 as listed in *Appendix A*.

914.6 Acceptance Tests: All Standpipe systems shall be tested in accordance with NFPA listed in *Appendix A*.

914.6.1 Underground Connections:
Underground mains and lead-in connections shall be flushed and tested in accordance with NFPA 14 and NFPA 24 listed in *Appendix A*.

914.7 Standpipe system requirements for buildings under construction or demolition:

914.7.1 General: Standpipes required by 780 CMR 914.7 are to be either temporary or permanent in nature, with or without a water supply, provided, however, that such standpipes conform to the requirements of 780 CMR 914.0 as to number of risers, capacity, outlets and materials.

914.7.2 Buildings under construction or demolition: Standpipe requirements for buildings under construction or demolition shall be in accordance with the provisions of 780 CMR 3305.3 and NFPA 241 as listed in *Appendix A*.

**780 CMR 915.0 FIRE DEPARTMENT
CONNECTIONS**

915.1 Required: All required water fire-extinguishing and *standpipe systems* shall be provided with a fire department connection in accordance with the applicable NFPA standards. Standpipes in buildings under construction or

demolition shall conform to 780 CMR 3305.3 and NFPA 241 listed in *Appendix A*.

Exceptions:

1. *Limited area sprinkler systems* supplied from the domestic water system.
2. Where the local fire department approves a single connection for large diameter hose of at least four inches.
3. *An automatic sprinkler system* with less than 20 *sprinklers*.

915.2 Connections: Fire department connections shall be arranged in such a manner that the attachment to any one water *sprinkler* connection will serve all sprinklers, and the attachment to any one standpipe connection will serve all *standpipes* within the building.

915.3 Location: Fire department connections shall be located and shall be visible on a street front or in a location approved by the fire department. Such connections shall be located so that immediate access is provided to the fire department. Fire department connections shall not be obstructed by fences, brushes, trees, walls or any other similar object.

915.4 Height: Fire department connections shall not be less than 18 inches (457 mm) and not more than 42 inches (1067 mm) in elevation, measured from the ground level to the centerline of the inlets.

915.5 Projection: Where the fire department connection will otherwise project beyond the property line or into the *public way*, a flush-type fire department connection shall be provided.

915.6 Hose thread: Hose thread in the fire department connection shall be uniform with that used by the local fire department.

915.7 Fittings: Fire department inlet connections shall be fitted with check valves, ball drip valves and plugs with chains or frangible caps.

915.8 Signs: A metal sign with raised letters at least one inch (25 mm) in height shall be mounted on all fire department connections serving *sprinklers* or *standpipes*. Such signs shall read "Automatic Sprinklers" or "Standpipe," or both, as applicable.

780 CMR 916.0 YARD HYDRANTS/ UNDERGROUND FIRE MAINS

916.1 Fire hydrants: Fire hydrants and underground fire mains installed on private property shall be located and installed as directed by the fire department. Hydrants shall conform to the standards of the administrative authority of the jurisdiction and the fire department. Hydrants shall not be installed on a water main less than six inches in diameter. Standards of construction shall be in accordance with NFPA 24 as listed in *Appendix A*.

780 CMR 917.0 FIRE PROTECTIVE SIGNALING SYSTEMS (Fire Alarm System)

917.1 General: Fire protective signaling systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFPA 72 listed in *Appendix A*.

917.2 Fire Protection Construction documents: Where a fire protective signaling system is required by 780 CMR, the *fire protection construction documents* shall show the location and number of all alarm-initiating devices and alarm notification appliances, and shall provide a description of all equipment to be used, proposed zoning, a list of auxiliary control functions (i.e., elevator capture), location of the control panel(s) and annunciator(s), and a complete sequence of operation for the system. (Also see 780 CMR 903.0)

917.3 Approval: All devices, combinations of devices, appliances and equipment shall be approved for the fire protective signaling purpose for which such equipment is used.

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917.4 Where required: A fire protective signaling system shall be installed and maintained in full operating condition in the locations described in 780 CMR 917.4.1 through 917.4.6.

917.4.1 Use Group A or E: A fire protective signaling system shall be installed and maintained in all occupancies in Use Group A or E.

917.4.2 Use Group B: A fire protective signaling system shall be installed and maintained in all occupancies in Use Group B where such buildings have occupied floors which are two or more stories above the lowest *level of exit discharge* or which have floors two or more stories below the highest *level of exit discharge*.

917.4.3 Use Group H: A fire protective signaling system shall be installed and maintained in all occupancies in Use Groups H.

917.4.4 Use Group I: A fire protective signaling system shall be installed and maintained in all occupancies in Use Group I.

917.4.5 Use Group R-1: A fire protective signaling system shall be installed and maintained in all occupancies in Use Group R-1.

917.4.6 Use Group R-2: A fire protective signaling system shall be installed and maintained in all occupancies in Use Group R-2 containing 13 or more dwelling units or where any *dwelling unit* is located more than three stories above the lowest *level of exit discharge* or more than one

story below the highest *level of exit discharge* of *exits* serving the *dwelling unit*.

917.5 Location: Manual fire alarm boxes shall be located not more than five feet (1524 mm) from the entrance to each *exit*. Manual fire alarm boxes shall be located in each story including basements. In buildings of use group A where a stage is provided, a manual fire alarm box shall be located next to the lighting control panel. For fire alarm systems employing automatic fire detection or water flow devices, at least one manual fire alarm box shall be provided to initiate a fire alarm signal. This manual fire alarm box shall be located where required by the Head of the Fire department or his or her designee.

Exception:

1. In buildings of use group A, assembly occupancy, and where approved by the local fire department, manual fire alarm boxes may be omitted at *exits* and any other required locations, but shall be provided at constantly attended locations such as ticket booths, refreshment facilities, bars, etc. Where the building official determines that it is impractical to have a constantly attended location in an assembly occupancy other than a theater, manual fire alarm boxes shall be provided at each required building *exit*.
2. Except as provided in 917.5, manual fire alarm boxes are not required in an occupancy in Use Group B where the height of the building is 70 feet or less above the lowest level of fire department vehicle access and the building is equipped throughout with an *automatic sprinkler system*, and/or an *automatic fire detection system* or combination thereof, in accordance with 780 CMR 906.0 and 780 CMR 918.0.

917.5.1 Manual fire alarm boxes: The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 54 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box. Manual fire alarm boxes shall be red in color. In all occupancies in Use Group I-3, the manual fire alarm boxes shall be permitted to be

locked in areas where staff is present whenever such areas are occupied and keys are readily available to unlock the boxes, or the boxes shall be located in a manned staff location which has direct supervision of the sleeping area.

Exception: Where 521 CMR, Architectural Access Board regulations apply, manual fire alarm box height shall be as prescribed in 521 CMR.

917.6 Power supply: The primary and secondary power supply for the fire protective signaling system shall be provided in accordance with NFPA 72 listed in *Appendix A*.

917.7 Wiring: All wiring shall conform to the requirements of NFPA 72 and 527 CMR 12.00: Massachusetts Electrical Code listed in *Appendix A*. Wireless systems utilizing radio frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72 listed in *Appendix A*.

917.7.1 Activation: The alarm notification appliances shall be automatically activated by all of the following where provided:

1. Smoke detectors, other than single- and multiple-station smoke detectors, as required by 780 CMR 919.0;
2. *Sprinkler* water-flow devices;
3. Manual fire alarm boxes; and
- 4 Other approved types of automatic fire detection devices, extinguishing, or suppression systems.

Exceptions:

1. Smoke detectors in an occupancy in Use Group I-3 are permitted to actuate an audible alarm-indicating appliance at a constantly attended location and are not required to activate a general alarm.
2. Audible alarms in buildings of Use Group A with an occupant load greater than 300 persons shall sound only in a constantly attended receiving station within the

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building for purposes of initiating emergency action. Occupant notification shall be by means of either voice or prerecorded message announcement initiated by the person in the constantly attended receiving station and in accordance with 780 CMR 917.9. In buildings of Use Group A utilizing reduced lighting levels on a regular basis, lights providing normal lighting levels shall be activated simultaneously with the beginning of the voice or prerecorded message announcement. Where the building official determines that it is impractical to have a constantly attended location in an assembly occupancy the fire alarm system shall be arranged to automatically provide prerecorded evacuation instructions.

3. For mixed use group occupancies that contain an A use group the use group A area shall be in accordance with 780 CMR 917.7.1 exception 2.

917.7.1.1 Length of evacuation signal:

Automatic deactivation of audible and visible alarms shall not be allowed.

Exception: Automatic deactivation of audible alarms after a period of operation of 15 minutes shall be permitted when approved by the local fire department. Automatic deactivation of audible alarms shall only be permitted when the fire alarm system is supervised in accordance with 780 CMR 923.2 or by an approved auxiliary fire alarm system in accordance with NFPA 72.

917.7.2 Presignal or positive alarm sequence system: Presignal or positive alarm sequence

systems shall not be installed unless approved by the code official and by the local fire department. Where a presignal or positive alarm sequence system is installed, 24-hour supervision by trained personnel shall be provided at a location approved by the local fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

917.7.3 Zones: Each floor shall be zoned separately and a zone shall not exceed 20,000 square feet (1860 m²). The length of any zone shall not exceed 300 feet (91440 mm) in any direction. A zoning indicator panel and the associated controls shall be provided in a location approved by the local fire department. Where individually addressable alarm initiating devices are used, a single circuit (or pathway) shall not exceed the above size limitations unless the circuit is a Class A circuit, and the style and device loading meets the requirements for proprietary systems as listed in NFPA 72. Where individually addressable alarm initiating devices are logically combined into groups for annunciation purposes, the above zone size limitations shall apply to the group. The local fire department shall approve all zone and point descriptions. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible alarm - silencing switch. In buildings that have floors located more than 70 feet above mean grade, a separate zone by floor shall be provided for the following types of alarm-initiating devices where provided:

1. Smoke detectors;
2. *Sprinkler* water-flow devices;
3. Manual fire alarm boxes; and
4. Other approved types of automatic fire detection devices, extinguishing, or *suppression systems*.

Exceptions:

1. *Automatic sprinkler system* zones shall not exceed the area permitted by NFPA 13 listed in **Appendix A**.

2. Duct type smoke detectors shall be separately identified with a remote test/indicator station. The location of the remote test/indicator shall be approved by the local fire department.

917.8 Alarm notification appliances: Alarm notification appliances of the approved type shall be provided.

917.8.1 Visible alarms: Visible alarm notification appliances shall be provided in accordance with NFPA 72 and 521 CMR in public and common areas of all buildings and areas of buildings housing the hearing impaired and where required by 521CMR. In occupancies in Use Groups I-1 and R-1, all required accessible sleeping rooms and suites plus an additional number of sleeping rooms or suites in accordance with Table 917.8.1 shall be provided with a visible alarm notification appliance, activated by both the in-room smoke detector and the building fire protective signaling system. In hospital intensive care units, special care units and operating rooms, the audible signal need not be sounded; however a visual alarm shall be displayed with an approved device.

917.8.1.1 Visible alarm synchronization: Where more than one visible signal can be viewed from one location the visible signals shall be synchronized.

**Table 917.8.1
VISIBLE AND AUDIBLE ALARMS**

Number of sleeping rooms or suites	Sleeping rooms or suites with visible and audible alarms
6 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of total

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1,001 and over	20 plus 1 for each 100 over 1,000
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917.8.2 Audible alarms: Audible alarm notification appliances shall be provided and shall sound a distinctive sound which shall not be used for any purpose other than that of a fire alarm. The audible alarm notification appliances shall provide a sound pressure level of 15 dBA above the average ambient or 5 dBA above the maximum sound level having a duration of at least 60 seconds (whichever is greater) sound level in every occupied space within the building. The minimum sound pressure levels shall be: 70 dBA in occupancies in Use Groups R and I-1; 90 dBA in mechanical equipment rooms; and 60 dBA in all other use groups. The maximum sound pressure level for audible alarm notification appliances shall be 120 dBA at the minimum hearing distance from the audible appliance.

917.8.2.1 All audible evacuation signals shall have a synchronized three - pulse temporal pattern in accordance with NFPA 72.

917.9 Voice/alarm signaling system: A voice/alarm signaling system shall be provided where required by other sections of 780 CMR. When activated in accordance with 780 CMR 917.7.1, the voice/alarm signaling system shall automatically sound an alert signal to all occupants within the building on a general or selective basis to the following terminal areas: elevators, elevator lobbies, *corridors*, *exit stairways*, rooms and tenant spaces exceeding 1,000 square feet (93 m²) in area; *dwelling units* in occupancies in Use Group R-2; and guestrooms or suites in occupancies in Use Group R-1. The *fire command station* shall contain controls to transmit

manually an evacuation signal and voice instructions on a selective and all-call basis to the terminal areas indicated herein. The voice/alarm system shall be designed and installed in accordance with the provisions of 780 CMR, 527 CMR and NFPA 72 listed in *Appendix A*.

Exceptions:

1. A distinctive signal in lieu of a voice alarm is permitted in an occupancy in Use Group F or S.
2. Where the head of the fire department or his/her designee determines that partial or selective evacuation is not desired, but rather total evacuation is required, then a distinctive signal, in lieu of a voice alarm, is permitted.

917.9.1 The sequence of operation of the voice alarm signaling system shall be as follows:

1. Sound an alert (pre-signal) tone (the alert tone shall be a 900 hertz tone pulsed to produce one round of code 4 at approximately one second intervals.
2. Activate the recorded message regarding the evacuation procedure. The alarm and communications system shall provide a pre-recorded message to all required areas. The message shall contain the following information. “attention please. The signal tone you have just heard indicated a report of an emergency in this building. If your floor evacuation signal sounds after this message, walk to the nearest stairway and leave the floor. While the report is being verified, occupants on other floors should await further instructions.”

This message shall be transmitted three times.

A female voice shall be used for this message.

3. Activate the evacuation signal on the floor of incident and the next floor above and below (the evacuation signal shall be in accordance with 780 CMR 917.8.2.1

917.10 Acceptance tests: Upon completion of the fire protective signaling system, all alarm notification devices and circuits, alarm indicating appliances and circuits, supervisory-signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies shall be subjected to a 100% acceptance test in accordance with NFPA 72 listed in *Appendix A* and 780 CMR 903.0.

780 CMR 918.0 AUTOMATIC FIRE DETECTION SYSTEMS (FIRE ALARM SYSTEMS)

918.1 General: Automatic fire detection systems shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFPA 72 listed in *Appendix A*.

918.2 Fire Protection Construction documents: Where an automatic fire detection system is required by 780 CMR, the *fire protection construction documents* shall show the location and number of all *automatic fire detectors* with specifications of the type of fire detector, proposed zoning and a complete sequence of operation for the system. The system shall be installed in accordance with 780 CMR 918.0 and shall be part of and be subject to the requirements of a fire protective signaling system specified in 780 CMR 917.0. (Also see 780 CMR 903.0)

918.3 Approval: All devices, combinations of devices, appliances and equipment shall be approved for the fire signaling purpose for which such equipment is used. The *automatic fire detectors* shall be smoke detectors, except an approved alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.

918.4 Where required: An *automatic fire detection system* shall be installed and maintained in full

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operating condition in the locations described in 780 CMR 918.4.1 through 918.4.7.

918.4.1 Use Group A-4: An *automatic fire detection system* shall be installed in all occupancies of use group A-4.

918.4.2 Use Group E: An *automatic fire detection system* shall be installed in all occupancies of use group E.

918.4.3 Use Group I-1: An *automatic fire detection system* shall be installed and maintained in all occupancies in Use Group I-1.

918.4.4 Use Group I-2: An *automatic fire detection system* shall be installed and maintained in all occupancies in Use Group I-2.

Exception: Occupancies that are equipped throughout with an *automatic sprinkler system* in accordance with 780 CMR 906.0 and that comply with 780 CMR 409.0.

918.4.5 Use Group I-3: An *automatic fire detection system* shall be installed and maintained in all resident housing areas of Use Group I-3. Smoke detectors shall be arranged and positioned to prevent damage or tampering provided that the function and speed of detecting a fire is equivalent to that provided by the spacing and arrangement requirements of NFPA 72 listed in *Appendix A*.

918.4.6 Use Group R-1: An *automatic fire detection system* shall be installed and maintained throughout all occupancies in Use Group R-1 and in accordance with Table 918.

TABLE 918
RESIDENTIAL FIRE PROTECTION REQUIREMENTS

Use Group	Number of Units	Unit Occupant Protection	Other Occupant Protection	Standby Power	Manual Stations	Zoned	Provision for Fire Department Notification
R-3	1 or 2	Yes 919.3.2	Note a.	Yes 919.5	N.A.	N.A.	N.A.
R-1	3 to 12	Yes 919.3.1	Yes 918.4.6	Yes 917.6	Yes 917.4.5	N.A.	N.A.
R-2	3 to 12	Yes 919.3.2	Yes 918.4.7	Yes 919.5	Yes 917.4.6	N.A.	N. A.
R-1	13 or more	Yes 919.3.1	Yes 918.4.6	Yes 917.6	Yes 917.4.5	Yes 917.7.3	Yes 923.2
R-2	13 or more	Yes 919.3.2	Yes 918.4.7	Yes 919.5	Yes 917.4.6	Yes 917.7.3	Yes 923.2

Note a: Where common areas exist.

Exceptions:

1. An *automatic fire detection system* is not required in buildings that do not have interior *corridors serving* guestrooms or dwelling units and where all guestrooms or dwelling units have a *means of egress* door opening directly to an exterior *exit access* which leads directly to the *exits*.

2. Guest rooms or dwelling units single or multiple station smoke detectors required by 780 CMR 919.3.1 shall also be annunciated by guest room or dwelling unit at a constantly attended location from which the fire protective signaling system is capable of being manually activated. Detector annunciation shall be capable of operation from stand-by battery or be connected to an emergency electrical system. System smoke detectors shall be permitted providing they operate as follows: a. Provide unit occupant notification; b. Annunciate at a constantly attended location from which the fire protective signaling system is capable of being manually activated; c. Does not automatically activate the building notification appliances; d. Does not automatically activate the supervision requirements of 780 CMR 923.2; e. Be capable of operation including the required annunciation from stand-by battery.

3. A system heat detector shall be required within each guest room or *dwelling unit*

located not more than six feet from each door way that leads to an interior *corridor* or exit. System heat detectors shall not be required where the guestroom or *dwelling unit* is equipped with residential *sprinklers* that when activated will activate the fire protective signaling system.

918.4.7 Use Group R-2: An *automatic fire detection system* shall be installed and maintained throughout all occupancies in use group R-2 and in accordance with table 918.

Exceptions:

1. An *automatic fire detection system* is not required in buildings that do not have interior *corridors serving* guestrooms or *dwelling units* and where all guestrooms or *dwelling units* have a *means of egress* door opening directly to an exterior *exit access* which leads directly to the *exits*.

2. System smoke detectors are not required in guestrooms or *dwelling units*.

3. A system heat detector shall be required within each guest room or *dwelling unit* located not more than six feet from each door way that leads to an interior *corridor* or exit. System heat detectors shall not be required where the guestroom or dwelling unit is equipped with residential sprinklers that, when

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activated, will activate the fire protective signaling system.

918.5 Sprinklered buildings exception: Buildings equipped throughout with an *automatic sprinkler system* in accordance with 780 CMR 906.2.1 or 780 CMR 906.2.2 are not required to be equipped with an automatic fire detection system, but are required to be equipped with a fire protective signaling system that conforms to 780 CMR 917.0. This exception does not apply to Use Groups I, R-1, R-2, to high-hazard use groups in accordance with 780 CMR 417.5.3, to special amusement buildings in accordance with 780 CMR 413.0, or to single-station smoke detectors as required in 780 CMR 919.3.

918.6 Zones: Zoning shall be provided in accordance with 780 CMR 917.7.3.

918.7 Alarm verification: Alarms activated by smoke detectors required by 780 CMR 918.0 shall

918.9 Access: Access shall be provided to each detector for periodic inspection, maintenance and testing.

780 CMR 919.0 SINGLE- AND MULTIPLE-STATION SMOKE DETECTORS

919.1 General: Single- and multiple-station smoke detectors shall be of an approved type and shall be installed in accordance with the provisions of 780 CMR and NFPA 72 listed in *Appendix A*.

919.1.1 A control and associated equipment, single or multiple station alarm devices or any combination thereof shall be permitted to be used as a *household fire warning system* provided that the requirements of NFPA 72 Chapter 2 are met.

919.2 Fire Protection Construction documents: Where single- and multiple station smoke detectors are required by 780 CMR, the *fire protection construction documents* shall show the location and number with specifications of the type of detector. (Also see 780 CMR 903.0.)

be activated by a single smoke detector monitored by an *alarm verification* zone or an approved equivalent method.

918.8 Local control functions: *Automatic fire detectors* utilized for the purpose of performing local control functions shall be a part of a fire protective signaling system. The detector shall, upon actuation, perform the intended function and activate the alarm notification devices or activate a visible and audible supervisory signal at a constantly attended location.

Exception: In buildings not required to be equipped with a fire protective signaling system, the *automatic fire detector* shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72 listed in *Appendix A*. This exception does not apply to smoke detectors required for elevator recall.

919.3 Where required: Single and multiple station smoke detectors or household fire warning systems shall be installed and maintained in full operating condition in the locations described in 780 CMR 919.3.1 through 919.3.3. Any smoke detector located within 20 feet of a kitchen or within 20 feet of a bathroom containing a tub or shower shall be a photo electric type smoke detector.

919.3.1 Use Group R-1: Single and multiple station smoke detectors or household fire warning systems shall be installed and maintained in the following locations in Use Group R- 1:

1. In all sleeping areas;
2. In every room or hallway in the path of the *means of egress* from the sleeping area to the door leading from the guestroom or suite; and
3. In each story within the guestroom or suite, including *basements*.

Exception: For suites or guestrooms or *dwelling unit* with split levels and without an intervening door between the adjacent

levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

919.3.2 Use Groups R-2, R-3, R-4 and R-5:

Single and multiple station smoke detectors or household fire warning systems shall be installed and maintained in all occupancies in Use Groups R-2, R-3, R-4 and R-5 at the following locations:

1. In the immediate vicinity of bedrooms;
2. In all bedrooms; and
3. In each story within a *dwelling unit*, including *basements*.
4. In Residential Units of 1200 sq. ft. or more, Automatic Fire Detectors, in the form of Smoke Detectors shall be provided for each 1200 square feet of area or part thereof;

Exceptions:

1. In *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
2. In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with 780 CMR 906.2.1, 906.2.2 or 906.2.3, smoke detectors are not required in bedrooms where the bedrooms are equipped with residential sprinklers.

919.3.3 Use Group I-1: Single and multiple station smoke detectors or household fire warning systems shall be installed and maintained in all sleeping areas in occupancies in Use Group I- 1.

920.2 Where required: A portable fire extinguisher shall be installed in the following locations in accordance with NFPA 10 listed in *Appendix A*:

1. In all occupancies in Use Group A-1, A-2, A-3, B, E, I-2, M, R-1 or H;

Exception: Where the building is equipped throughout with an automatic detection system in accordance with 780 CMR 918.4.

919.4 Interconnection: Where more than one detector is required to be installed within an individual *dwelling unit* in an occupancy in Use Group R-2 , R-3 or R4, or within an individual guestroom or suite in an occupancy in Use Group R-1, the detectors shall be wired in such a manner that the actuation of one alarm will actuate all of the alarms in the individual unit.

919.5 Battery backup: In addition to the required AC primary power source, required smoke detectors in occupancies in Use Groups R-2, R-3, R-4, R-5 and I-1 shall receive power from a battery when the AC primary power source is interrupted.

Exception: In buildings equipped throughout with an *automatic sprinkler system* installed in accordance with 780 CMR 906.2.1, 906.2.2 or 906.2.3.

919.6 Acceptance testing: When the installation of the detectors is complete, each detector - and all interconnecting wiring for multiple-station detectors shall be subject to a 100% acceptance test in accordance with NFPA 72 listed in *Appendix A*

780 CMR 920.0 FIRE EXTINGUISHERS

920.1 Approval: Portable fire extinguishers shall bear the label of an *approved agency*, be of an approved type and be installed in a location visible and available to the occupants.

2. In all areas containing commercial kitchen exhaust hood systems;
3. In all areas where fuel is dispensed;

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4. In all areas where a *flammable* or *combustible liquid* is used in the operation of spraying, coating or dipping;
5. In all occupancies in Use Group I-3 at staff locations. Access to portable extinguishers shall be permitted to be locked;
6. On each completed floor of buildings under construction, other than occupancies in Use Group R-3.
7. In any laboratory, shop or other room occupied for similar purposes; and
8. Where required by the fire prevention code listed in *Appendix A*.

780 CMR 921.0 SMOKE CONTROL SYSTEMS

921.1 General: Smoke control systems required by 780 CMR shall conform to the provisions of 780 CMR 921.0

921.2 Design criteria: The smoke control system shall be designed to keep the smoke layer interface above the highest of either the highest unprotected opening to adjoining spaces, or six feet (1829 mm) above the highest floor level of *exit access* open to the atrium for a period of 20 minutes. The limiting height for the smoke layer interface for *stages* shall be in accordance with 780 CMR 412.3.8.2. The limiting height of the smoke interface above the floor of the space required to be provided with smoke control is Z_{cr} . Provisions shall also be made to provide for smoke removal from the space at a rate of not less than two air changes per hour by means of natural or mechanical *ventilation*.

921.2.1 Passive system: Active smoke control is not required where it is shown that the smoke interface level requirement will be met without operating smoke exhaust.

921.2.1.1 Regular spaces: For spaces with flat ceilings, a constant horizontal cross-sectional area above the smoke layer interface, and an A/H^2 ratio between 0.9 and 14, the following

equation shall be used to estimate the height of the interface at 20 minutes

$$Z = 0.67 H - 0.28 H \ln \left[\frac{t Q_c H}{A} \right]$$

where:

Z = Height from floor to the smoke interface (feet).

t = Time for interface to descent to Z ; Use 1,200 seconds.

H = Height of the space required to be provided with smoke control; floor to flat ceiling (feet).

Q_c = Steady state heat release rate; Use 4,400 Btu/sec. where the primary use group is M, S-1 or F-1. Otherwise use 2,000 Btu/sec.

A = Horizontal cross-sectional area of the above ceiling space being filled (square feet). Maximum A to be used shall be: $A = 14 H^2$.

921.2.1.2 Irregular spaces: For spaces with sloped or irregular ceilings, A/H^2 ratios outside the specified range, or varying cross sections, the filling time shall be determined using numerical integration from the ceiling to the critical smoke interface. The following equations shall be used to determine the rate of smoke production:

Where the interface level is above the limiting elevation (z_1) use:

$$V = 17.6 Q_c^{1/3} Z^{5/3} + 3.36 Q_c$$

Where the interface level is below the limiting elevation (z_1) use:

$$V = 16.64 Q_c^{3/5} Z$$

where:

V = The volumetric rate of smoke production (cubic feet per minute).

z_1 = Limiting elevation (ft) = $0.533 Q_c^{2/5}$

Q_c = The convective portion of the heat release rate shall be estimated as 70 percent of the total heat release rate, Q .

921.2.2 Mechanical systems: Where the smoke filling predicted in 780 CMR 921.2.1 does not meet the design criteria of 780 CMR 921.2, mechanical exhaust shall be provided to maintain these conditions.

921.2.2.1 Exhaust quantities: Sufficient mechanical exhaust shall be provided to maintain the smoke layer interface at or above the critical elevation for the 20-minute period. The volumetric rate of smoke production (V) shall be determined by the equations in 780 CMR 921.2.1.2. If the rate of smoke exhaust is less than the rate of smoke production, the minimum exhaust rate to be supplied for smoke control shall be determined in accordance with Table 921.2.2.1.

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Table 921.2.2.1
MINIMUM EXHAUST RATE ADJUSTMENT
FACTOR^a

Z/H	t/t_o					
	V_e/V					
	0.25	0.35	0.50	0.70	0.85	0.95
0.2	1.12	1.19	1.30	1.55	1.89	2.49
0.3	1.14	1.21	1.35	1.63	2.05	2.78
0.4	1.16	1.24	1.40	1.72	2.24	3.15
0.5	1.17	1.28	1.45	1.84	2.48	3.57
0.6	1.20	1.32	1.52	2.00	2.78	4.11
0.7	1.23	1.36	1.61	2.20	3.17	4.98
0.8	1.26	1.41	1.71	2.46	3.71	6.25

Note a. Notation:

Z = Design height of smoke layer interface above fire source.

H = Ceiling height above fire source.

t = Time for smoke layer interface to descend to Z (with exhaust) (seconds).

t_o = Value of t in absence of smoke exhaust (see 780 CMR 921.2.1.1 or 921.2.1.2) (seconds).

V_e = Smoke control exhaust rate (minus any airflow into the smoke layer other than that from the plume).

V = Volumetric smoke production rate (from the equations in 780 CMR 921.2.1.2).

921.2.3 Operation: The smoke control system shall be a dedicated system or shall be integrated with the mechanical *ventilation* system of the building. Operation of the smoke control system shall automatically shut down all systems and devices which interfere with the effective operation of the smoke control system. Where the mechanical *ventilation* system is designed for smoke control, the return air shall be moved directly to the outside without recirculation to other areas of the building.

921.2.4 Alternative systems: An engineered design which will achieve the same level of smoke control as described in 780 CMR 921 is permitted in lieu of these requirements and otherwise in conformance with the requirements of 780 CMR 903.2.1.

921.3 Smoke removal: Provisions shall be made to provide *ventilation* at a rate of at least two air changes per hour from the space required to be provided with smoke control. This *ventilation* shall be through openable vents, separate mechanical exhaust, or through the building mechanical *ventilation* system. The exhaust inlets shall be located a minimum of six feet (1829 mm) above any *exit access* walkway and above any openings into adjoining spaces. The smoke removal system shall be activated by manual controls provided for fire department use unless it is part of the smoke control system.

921.4 Activation: The smoke control system shall be activated by actuation of the following:

1. *Automatic sprinkler system*;
2. Smoke detectors required by 780 CMR 921 that comply with NFPA 72 listed in **Appendix A**; and
3. Manual controls provided for fire department use.

Note: The smoke control system shall not be activated by a manual fire alarm system.

921.4.1 Manual control: Manual controls shall be provided at a location approved by the fire department.

921.4.2 Smoke detector activation: Where the height of the ceiling of the space required to be provided with smoke control exceeds 30 feet (9144 mm) above the floor of the space, approved smoke detectors shall be provided to detect smoke above the highest floor open to an atrium or at the highest point of another space required to be provided with smoke control. The installation of smoke detectors shall comply with 780 CMR 918.0.

921.5 Standby power: All equipment required to provide smoke control in floor openings connecting three or more stories and stage areas in accordance with 780 CMR 412.3.8.2 shall be equipped with a

standby source of power that complies with 527 CMR 12.00 as listed in *Appendix A*.

921.6 Acceptance: Any required smoke control design that requires operation of mechanical equipment shall be functionally tested in accordance with 780 CMR 921.6.2 until proper operation of all required mechanical equipment and controls is demonstrated.

921.6.1 System operation report: Prior to acceptance testing, a report of the required system operations shall be provided to the code official. (**NOTE:** also see 780 CMR 903.1.1.1.a., b. and c. The following items shall be included in the report if part of the required system:

1. Identify type(s) of smoke control activation signal(s), such as *sprinkler* waterflow, smoke detection, manual, etc., and associated smoke
7. Identify damper(s) which shall be "Closed" to implement the smoke control system.
8. Identify other functions required to implement the smoke control system.
9. Identify *building areas* with smoke and heat vents and method of operation of vents.
10. If required, identify the type(s) of standby power and the equipment that is served.

921.6.2 Testing procedures: The acceptance test procedure shall be approved. Acceptance testing shall be conducted in the presence of the Building official and fire official or their designees or shall include documentation indicating that all mechanical equipment, control sequences, devices and components have been operationally tested and are functioning properly in accordance with the system operation report. Such documentation provided by a *registered professional engineer* or other legally recognized professional (M.G.L. c. 112, § 81R). All documentation from operational testing shall be available for inspection. Acceptance testing shall include the following:

1. Prior to beginning acceptance testing, all building smoke control equipment shall be placed in the normal operating mode.

control system operation(s) that are activated by the signals.

2. Identify *building area(s)* where maximum mechanical exhaust to the outside is implemented and supply air is not provided.
3. Identify *building area(s)* where maximum air supply is implemented and exhaust to the outside is not provided.
4. Identify fan(s) which shall be "On" as required to implement the smoke control system. If multiple speed fans are used, the capacity at which the fans shall operate in the smoke control mode shall be identified.
5. Identify fan(s) which shall be "Off" as required to implement the smoke control system.
6. Identify damper(s) which shall be "Open" to implement the smoke control system.

2. Acceptance testing shall demonstrate that each initiating device, fan, damper and other required equipment is operational and performs to the limits and capacity required.
3. Acceptance testing shall demonstrate that correct control outputs are produced for a given control input for each control sequence specified by the system operation report.
4. If standby power is required for the operation of the smoke control system, acceptance tests shall be conducted while on both normal building power and standby power.
5. Opening of smoke/heat vents shall be demonstrated if the vent is capable of being opened in a manner that does not require destructive testing.

921.7 Elevators: Except when otherwise required by 524 CMR, where buildings are equipped with a mechanical smoke control system that will restrict smoke and hot gases from entering the elevator shaft in the fire floor, hoistway venting is not required. In high-rise buildings equipped with this system and equipped throughout with an automatic fire suppression system, the one-hour fireresistance rated

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elevator lobby as specified in 780 CMR 403.8 is not required.

780 CMR 922.0 SMOKE AND HEAT VENTS

922.1 General: Where *exit access* travel distance is increased in accordance with 780 CMR 1006.5.1, smoke and heat vents shall be constructed and installed in accordance with 780 CMR 922.0.

922.2 Vent size and spacing: The vent area and the spacing of the vents shall comply with Table 922.2.

922.2.1 Releasing devices: Smoke and heat vents shall open automatically by activation of a heat-responsive device rated at 100°F (38°C) to 220°F (104°C) above ambient. The releasing mechanism

shall be capable of operation such that the vent shall fully open when the vent is exposed to a time-temperature gradient that reaches an air temperature of 500°F (260°C) within five minutes. Vents shall be capable of being opened by an approved manual operation.

922.3 Curtain board construction: Curtain boards shall be provided to subdivide a vented building. Curtain boards shall be constructed of material that will resist the passage of smoke and is consistent with the building type of construction. Curtain board location and depth shall comply with Table 922.2. The bottom of the curtain board shall be level.

Table 922.2
SMOKE AND HEAT VENT SIZE AND
SPACING^b

Use Group	Hazard classification of contents ^a	Vent height above the floor, <i>H</i> (feet)	Minimum curtain board depth from vent bottom (feet)	Maximum area formed by curtain boards (square feet)	Vent area to floor area ratio	Maximum spacing of vent centers (feet)	Maximum distance from wall of curtain boards (feet)	Maximum distance between curtain boards
F-1	-	-	0.2XH but ≥ 4	50,000	1:100	120	60	8 X H but ≤ 250 feet
S-1	I through IV	20 or less	6	10,000	1:100	100	60	8 X H
S-1	I through IV	Over 20 to 40	6	8,000	1:75	100	55	8 X H but ≤ 250 feet
S-1	I through IV	20 or less	4	3,000	1:75	100	55	8 X H
S-1	I through IV	Over 20 to 40	4	3,000	1:50	100	50	8 X H but ≤ 250 feet
S-1	V	20 or less	6	6,000	1:50	100	50	8 X H
S-1	V	Over 20 to 30	6	6,000	1:40	90	45	8 X H
S-1	V	30 or more	4	2,000	1:30	75	40	8 X H but ≤ 100 feet

Note a. See NFPA 231 C listed in **Appendix A** for classification of Contents Class I through IV Class V commodities are products that present special fire hazards beyond those of Class I, II, III or IV, such as aerosols, foam plastic, PVC, PU, PS and asphalt paper.

Note b. 1 foot = 304.8 mm; 1 square foot = 0.093 m .

780 CMR 923.0 SUPERVISION

923.1 Fire suppression systems: All *automatic fire suppression systems* required by 780 CMR shall

be supervised by one of the following methods below.

1. A *UL listed or FM approved Central Station Service* in accordance with NFPA 72 listed in **Appendix A**.
2.
 - a. *Approved proprietary supervising station system*, in accordance with NFPA 72 in accordance with NFPA 72 as listed in **Appendix A**.
 - b. *Approved remote station fire alarm system supervising station* in accordance with NFPA 72 as listed in **Appendix A**.
3. Alarm signals to an approved Auxiliary Fire Alarm System in accordance with NFPA 72, with supervisory signals supervised by one or two above or at a constantly attended location approved by the local fire department, having personnel on duty trained to recognize the type of signal received and to take prescribed action. This shall be permitted to be a location different from that at which alarm signals are received.

Exceptions:

1. Underground gate valves with roadway boxes.
2. Halogenated extinguishing systems that are not an integral part of a required *automatic fire suppression system*.
3. Carbon dioxide extinguishing systems that are not an integral part of a required *automatic fire suppression system*.
4. Dry- and wet-chemical extinguishing systems.
5. *Limited area sprinkler systems* (see 780 CMR 907.0).
6. Occupancies in Use Group R complying with 780 CMR 906.2.2 and supervised in accordance with NFPA 13R listed in **Appendix A**.

923.1.1 Re-transmission of alarm signals received by central stations: In all cases, central stations shall re-transmit alarm signals within 90 seconds of receipt, to the fire department having jurisdiction.

923.2 Fire protective signaling systems and automatic fire detection systems: All *fire protective signaling systems* and automatic fire detection systems required by 780 CMR shall be supervised by one of the following methods below:

1. A *UL listed or FM approved Central Station Service* in accordance with NFPA 72 listed in **Appendix A**.
2.
 - a. *Approved proprietary supervising station system*, in accordance with NFPA 72 in accordance with NFPA 72 as listed in **Appendix A**.
 - b. *Approved remote station fire alarm system supervising station* in accordance with NFPA 72 as listed in **Appendix A**.
3. Alarm signals to an approved Auxiliary Fire Alarm System in accordance with NFPA 72, with supervisory signals supervised by one or two above or at a constantly attended location approved by the local fire department, having personnel on duty trained to recognize the type of signal received and to take prescribed action. This shall be permitted to be a location different from that at which alarm signals are received.

Exceptions:

1. *For use group R see table 918*
2. Single- and multiple-station detectors as required by 780 CMR 919.0.
3. Smoke detectors in occupancies in Use Group I-3 (see 780 CMR 917.7.1).
4. Smoke detectors in patient sleeping rooms in occupancies in Use Group 1-2 (see 780 CMR 409.5.1).
5. Fire protective signaling systems in occupancies in Use Groups H.

923.2.1 Re-transmission of alarm signals received by central stations: In all cases, central stations shall re-transmit alarm signals within 90 seconds of receipt, to the fire department having jurisdiction.

780 CMR 924.0 FIRE PUMPS

THE MASSACHUSETTS STATE BUILDING CODE

924.1 General: Where fire pumps are required to be installed as part of a required or non-required system(s), the fire pump(s) shall be designed and installed in accordance with 527 CMR 12.00 and NFPA 20 as listed in *Appendix A*.

924.2 Rooms: Fire pumps and all related equipment shall be located in a dedicated room meeting the

924.3 Emergency power: All fire pumps shall be provided with emergency power when installed in the following types of buildings or use groups. Emergency power equipment installation shall conform to 527 CMR 12.00 and NFPA 20 as listed in *Appendix A*.

1. High-rise buildings as defined by M.G.L. c. 148 § 26A and 780 CMR.

physical and environmental features of NFPA 20 listed in *Appendix A*, and enclosed with not less than two hours fire resistive construction. Fire pumps rooms shall have either direct access to the room from grade or access by a two hour rated passageway and shall be properly secured from unauthorized entry.

2. Buildings and structures of Use Group A, with a total occupant load of more than 300 occupants.
3. Buildings and structures of Use Group E, with a total occupant load of more than 300 occupants.
4. Buildings and structures of Use Group H.
5. Buildings and structures of Use Group I, having surgery or treatment areas.

NON-TEXT PAGE